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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TAKUYA TSUKAGOSHI

Appeal 2009-001956
Application 10/796,394
Technology Center 2800

Decided: May 28, 2010

Before KENNETH W. HAIRSTON, THOMAS S. HAHN
and BRADLEY W. BAUMEISTER, *Administrative Patent Judges*.
HAIRSTON, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. §§ 6(b) and 134 from the final rejection of claims 1 to 3. We will reverse.

The disclosed invention relates to a holographic recording and reproducing apparatus in which a pinhole is disposed at a confocal point of a Fourier transform lens and a reverse Fourier transform lens. The confocal

point can be located on either side of a holographic recording medium located between the two lenses (Figs. 3, 4; Spec. 12, 13).

Claim 1 is the only independent claim on appeal, and it reads as follows:

1. A holographic recording and reproducing apparatus for recording data as phase information of light in a holographic recording medium by projecting a signal beam and a reference beam thereonto, the holographic recording and reproducing apparatus comprising at least a spatial light modulator, a Fourier transform lens, a reverse Fourier transform lens, a Charge Coupled Device (CCD) image sensor and a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam, the holographic recording medium being disposed between the Fourier transform lens and the reverse Fourier transform lens, and the focal length of the Fourier transform lens and focal length of the reverse Fourier transform lens being different from each other and remain unchanged, and the pinhole being disposed between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Curtis	US 6,163,391	Dec. 19, 2000
Tanaka	US 6,301,028 B1	Oct. 9, 2001

Bernal, *Noise in high-areal-density holographic data storage systems*, Opt. Soc. America, May 1998, pp. 21, 22.

Chou, *Interleaving and error correction in volume holographic memory systems*, Applied Optics, Vol. 37, No. 29, October 10, 1998, pp. 6951-6968.

The Examiner rejected claims 1 to 3 under 35 U.S.C. § 103(a) based upon the teachings of Chou, Curtis, and Bernal.

The Examiner rejected claims 1 to 3 under 35 U.S.C. § 103(a) based upon the teachings of Chou, Tanaka, and Bernal.

Chou describes a holographic recording and reproducing apparatus that shows a holographic memory sandwiched between lenses 1 and 2 (Fig. 1; p. 6952). The two lenses are in turn sandwiched between a spatial light modulator (SLM) and a charge coupled device (CCD) camera.

The Examiner acknowledges:

> Chou et al. lacks a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens.

(Final Rej. 5)

According to the Examiner (Final Rej. 5, 6), Curtis describes a method and apparatus for holographic data storage in which: (1) recording medium 30, 520 may be located away from the focal point of the incident Fourier transform lens (Figs. 1, 15); (2) repositioning of the focal point of the Fourier transform lens may be performed by positioning the recording

medium away from the focal point of the Fourier transform lens (e.g., Fig. 13) or by using additional powered lenses 390 and 405 in Figures 10 and 11, respectively, to adjust the convergence or divergence of the incident light beam; and (3) the lenses and power optics "do not move prior, during, or after the recording and reproduction of information, and thus the focal length of the Fourier transform lens and focal length of the reverse Fourier transform lens remain unchanged during the recording and reproduction of the information." The Examiner indicates (Final Rej. 6) that Bernal places an aperture at the Fourier plane of a digital holographic storage system that uses a 4F lens design (Fig. 1). The Examiner concludes (Final Rej. 6) that the Fourier plane occurs at the confocal point of the lenses L_1 and L_2, and that the lenses "do not move prior, during, or after holographic recording and reproduction of information."

In view of the teachings of the applied references, the Examiner is of the opinion:

> [I]t would have been obvious to one having ordinary skill in the art at the time the invention was made to have the apparatus of Chou et al. further comprise a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens, as taught by Curtis et al. and Bernal et al., for the purpose of

> 1) minimizing the sensitivity of the holographic recording medium to shrinkage due to curing or temperature changes and 2) minimizing crosstalk noise.

(Final Rej. 6, 7)

Appellant argues *inter alia* (App. Br. 7, 8) that: (1) Curtis teaches "[t]he transforming lens 390 or the power element 405 is disposed in the path of the object beam at a position prior to the Fourier transform lens 390, thereby repositioning the dc focus 380 (focal point) either behind a Fourier transform plane 385 (if the diverging power element 405 is used) or in front of the Fourier transform plane 385 (if the converging transform lens 390 is used);" and (2) "the aperture of Bernal is not disposed between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens, as recited in claim 1" because Bernal teaches that "*either* the holographic recording material *or* the aperture is disposed at the Fourier plane."

Based upon the foregoing, we have to determine whether the Examiner erred by finding that it would be obvious to the skilled artisan based upon the teachings of the applied references to place a pinhole with respect to a holographic recording medium and lenses as set forth in claim 1 on appeal.

As indicated *supra*, the Examiner acknowledges that Chou lacks a pinhole disposed between the holographic memory and the lenses 1 and 2. We agree with Appellant's argument (App. Br. 7) that Curtis merely teaches repositioning the focal point of the object beam either in front of or behind the Fourier transform plane 385 via use of a transforming lens 390 in Figure 10 or a power element 405 in Figure 11. We also agree with Appellant's

argument (App. Br. 8) that Bernal teaches that "*either* the holographic recording material *or* the aperture is disposed at the Fourier plane." Since the applied references do not use an aperture/pinhole in conjunction with a holographic recording medium between the lenses as set forth in the claims on appeal, we agree with Appellant's argument (App. Br. 8) that "Chou, Curtis, and Bernal, taken alone or in combination fail to teach all the limitations of independent claim 1, in particular, 'the pinhole being disposed between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens.'"

In summary, the Examiner erred in finding that the skilled artisan would have found it obvious to use a pinhole in conjunction with a holographic recording medium and lenses as set forth in claim 1. Thus, the obviousness rejection of claims 1 to 3 is reversed because we agree with Appellant that the Examiner's articulated reasons for modifying the teachings of the reference to Chou with the teachings of Curtis and Bernal do not support a legal conclusion of obviousness. *KSR Int'l v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007).

Turning next to the obviousness rejection of claims 1 to 3 based upon the teachings of Chou, Bernal, and Tanaka, the Examiner indicates (Final Rej. 9) that the mask 50 in Tanaka (Figure 9) is a pinhole located at the confocal point of the Fourier transform lens 13 and the inverse Fourier transform lens 21, and that the mask/pinhole as well as the focal point are disposed between the holographic recording medium 10 and the Fourier transform lens 13. The Examiner is of the opinion (Final Rej. 10) that it

would be obvious to the skilled artisan to use a pinhole at the confocal point of the Fourier transform lens and the reverse Fourier transform lens in Chou based upon the teachings of Tanaka and Bernal. Appellant argues (Ap. Br. 10) *inter alia* that "Tanaka clearly illustrates that the mask 50 is not disposed at the confocal point of the Fourier transform lens 13 and the reverse Fourier transform lens 21."

Accordingly, we have to determine whether the Examiner erred by finding that it would be obvious to the skilled artisan to use a pinhole at the confocal point of the Fourier transform lens and the reverse Fourier transform lens in Chou based upon the teachings of Tanaka and Bernal.

Although the mask 50 in Tanaka is located between the Fourier transform lens13 and the holographic memory 10, the reference is silent as to mask 50 being located at the confocal point of the Fourier transform lens 13 and the reverse Fourier transform lens 21. As indicated *supra*, Chou only locates a holographic memory between lenses 1 and 2, and Bernal merely teaches that either a holographic recording medium or an aperture is disposed at the Fourier plane. Thus, we agree with Appellant's argument (App. Br. 13) that "Chou, Tanaka and Bernal, whether taken alone or in combination, fail to teach all the limitations of independent claim 1, in particular, 'a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens . . . the pinhole being disposed between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens.'" In summary, the Examiner's reasoning for modifying the

teachings of Chou with those of Tanaka and Bernal does not support a legal conclusion of obviousness.

The decision of the Examiner is reversed.

REVERSED

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